

**Clean Copy of Specification Paragraphs As Amended By This Response**

**New Title:**

Method of Forming A Test Insert For Interfacing A Device Containing Contact Bumps  
With A Test Substrate

**After the Title:**

This application is a divisional of co-pending application serial no. 09/250,994, filed February 16, 1999, to which priority is claimed

**Page 2, line 3:**

Recent trends of the semiconductor industry have led to development of smaller size semiconductor die. At the same time, the number of input/output lines required for the die have remained the same or have increased, thereby increasing their input/output densities. To accommodate these input/output density enhancements, the semiconductor manufacturers have developed alternative chip-scale packages.

**Page 2, line 23:**

Prior art, BGA test inserts, for example the insert as shown in Fig. 1, may not provide reliable testing of the globbed chip-scale-packaged, microelectronic devices. When using such prior art, test insert to test globbed chip-scale-packaged, microelectronic devices, a region of upper surface 19 of the test insert may contact the encapsulant protrusion 36 of the globbed chip-scale-packaged microelectronic device, so as to interfere and prevent engagement of its outwardly projecting-contacts 14 with respective pockets 16 of the test insert 10.

**Page 3, line 29:**

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These and other features of the present invention will become more fully apparent in the following description and independent claims, or may be learned by the practice of the invention as set forth hereinafter.

**Page 4, line 2:**

The present invention will be understood from reading the following description of the particular embodiments with reference to specific embodiments illustrated in the intended drawings. Understanding that these drawings depict only particular embodiments of the invention and are not therefore to be considered limiting of its scope, the invention will be described and explained with additional detail through use of the accompanying drawings in which:

**Page 6, line 13:**

The present invention relates to formation of an insert for receiving and testing a “globbed” chip-scale-packaged microelectronic device having an array of outwardly projecting contacts, e.g., of a ball-grid-array or bump-grid-array (BGA). Such insert may also be known by other terms such as, for example, interconnect, interposer, socket, BGA test socket, or silicon insert.

**Page 7, line 1:**

Recent trends of the semiconductor industry have reduced semiconductor die size, while increasing the number of input/output interconnects. These changes have lead to development of newer ball-grid-array or bump-grid-array (i.e., BGA) interface solutions capable of accommodating the smaller die of increased I/O densities. One such exemplary, prior art, BGA interface package comprises the globbed chip-scale-package.

**Page 7, line 26:**

Continuing with reference to Figs. 3A-3C, when trying to seat such globbed chip-scale-packaged microelectronic device 38 over prior art BGA test inserts – i.e., an insert similar to that of Fig. 1 – the encapsulant projection 36 of the package may confront a region of the upper surface of the insert as to interfere with and prevent the outwardly projecting contacts 14 of the device from engaging respective pockets 16 of the prior art insert.

**Page 9, line 20:**

After etching the pockets 16 and recess 17, mask 42 is removed and a dielectric 22 – for example, an oxide, nitride, carbide or the like – formed conformably over substrate 40, see Fig. 11. Dielectric 22 is formed by a known deposition process such as, for example, chemical vapor deposition (CVD).

**Page 10, line 9:**

Conductive layer 20 may comprise material of group IIIB through VIIIB metals, such as (but not limited to) the refractory metals, e.g., aluminum, iridium, copper, titanium, tungsten, tantalum, molybdenum, or alloys thereof. Conductive layer 20 might alternatively comprise other electrically conductive material such as, for example, metal-nitride of titanium-nitride or a silicide such as titanium-silicide. In a preferred exemplary embodiment, conductive layer 20, at regions associated with pockets 16, comprises an upper layer of titanium over a lower layer of aluminum. The upper layer is selected to prevent permanent or chemical bonding of the pocket liners to the conductive material of the outwardly projecting contacts to be seated therein. These conductive materials may be formed using known metal deposition processes, e.g., sputter, CVD, or PVD deposition. Additionally, the conductive materials can be patterned using known photolithographic, masking and etch procedures.

**Page 10, line 20:**

In another exemplary embodiment, conductive layer 20, at regions associated with bond pads 21, comprises a stack of two different layers, e.g., a lower barrier layer and an upper

bonding layer to which wire bonds may be attached, as set forth in U.S. Patent Number 5,592,736, issued January 14, 1997, entitled "Fabricating An Interconnect For Testing Unpackaged Semiconductor Dice Having Raised Bond Pads", which is hereby incorporated by reference. See also U.S. Patent Number 6,248,429, issued June 19, 2001, entitled "Metallized Recess In A Substrate", which is also incorporated herein by reference. In particular, the barrier and bonding layers are formulated to prevent oxidation of conductive materials associated with the interconnects, which oxidation might otherwise change the resistance of its contacts. The bonding layer is selected to facilitate wire bonding thereto. In a preferred exemplary embodiment, the barrier layer comprises a metal such as platinum, titanium, tungsten, or alloys thereof. As patterned, certain portions of conductive layer 20 define traces 23 while other portions define bond pad 21 in electrical communication with the conductive liners of pockets 16. Methods of forming the conductive material, traces and liners can be found in U.S. Patent Number 6,248,429, issued June 19, 2001, entitled "Metallized Recess In A Substrate", again incorporated herein by reference. In other more specific exemplary embodiments, regions of the conductive layer 20 associated with the bond pads may comprise multiple layers of conductive material such as, for example, a four layer stack (not shown) comprising titanium, tungsten, titanium and aluminum respectively.

**Page 12, line 12:**

In the illustrated exemplary embodiment, cover 54 acts together with biasing member 52 and force plate 50 to apply a biasing force against the globbed chip-scale-packaged microelectronic device 38, thereby forcibly engaging its outwardly projecting contacts 14 against pockets 16 of insert 10. Cover 54 includes clips 53 and tabs 57. Tabs 57, at the ends of clips 53, are received and captured by clamp ring 56 for securing the cover 54 to base 48. Cover 54 preferably comprises resilient metal, such as steel. Force plate 50 preferably comprises a solid material such as metal, plastic or ceramic. The force plate 50 is shaped to engage and apply a force across various surfaces of the globbed chip-scale-packaged microelectronic device 38. Biasing member 52 is disposed between the inside surface of cover 54 and force plate 50 to

apply a force against force plate 50 when cover 54 is secured to base 48. Biasing member 52 preferably comprises a resilient elastomeric material – e.g., silicone, butyl rubber, fluorsilicone, and polyimide – capable of exerting a biasing force over a continued life span. Additional aspects concerning elements of test jig 59 and its assembly are provided by U.S. Patent Application Number 09/\_\_\_\_\_, filed \_\_\_\_\_, entitled “Test Carrier With Variable Force Applying Mechanism For Testing Semiconductor Components” (98-0333), and U.S. Patent Number 5,796,264 entitled “Apparatus For Manufacturing Known Good Semiconductor Die”, which application and patent are incorporated herein by reference.

**Page 16, line 20:**

Thus, the present invention provides a new insert, method for forming an insert and method of testing a globbed chip-scale-packaged microelectronic device. Although the foregoing invention has been described with respect to certain exemplary embodiments, other embodiments will become apparent in view of the disclosure herein. Accordingly, the described embodiments are to be considered only as illustrative and not restrictive. The scope of the invention, therefore, is indicated by the appended claims and their combination in whole or in part rather than by the foregoing description. All changes thereto which come within the meaning and range of the equivalent of the claims are to be embraced within the scope of the claims.